EXHIBIT A

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

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WAYMO, LLC, :

Plaintiff, :

v. : Case No.

UBER TECHNOLOGIES, : 3:17-cv-00939-WHA

INC., OTTOMOTTO, LLC, :

and OTTO TRUCKING, :

INC., :

Defendants. :

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HIGHLY CONFIDENTIAL - ATTORNEYS' EYES ONLY

Videotaped Deposition of PHILIP HOBBS, taken at 777 Sixth Street, Northwest, 11th Floor, Washington, D.C. 20001-3706, commencing at 9:42 a.m., Friday, August 18, 2017, before Christina S. Hotsko, RPR, a Notary Public in and for the District of Columbia.

JOB No. 2680864

PAGES 1 - 175

A P P E A R A N C E S

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So tell me when you're at paragraph 55 of your report.

A. Got it.

Q. So here we see the parties' construction for diode, right? 11:35:50

A. Yes.

Q. In Uber's construction, diode is a two-terminal electronic device that allows the flow of current in one direction only.

That's not an accurate definition of 11:35:58 diode, correct?

A. It's accurate at the level in which the diode is being understood and discussed in the '936 patent.

Q. So the diode in the '936 patent, is it 11:36:07 your testimony that a person of skill in the art would look at that and say there's no leakage current in this diode?

A. I would say that leakage current is not discussed. 11:36:18

Q. But it's there?

A. It's not in the specification. So what that means is that the level -- the level of abstraction at which the circuit is being discussed excludes second-order effects like that. 11:36:30

Q. That wasn't quite my question. My question is, in the diode described in the '936 patent, there is leakage current, correct?

A. Not as described, no.

Q. I understand the words "leakage current" aren't used. But if a person of skill in the art picked up the '936 patent and they looked at the diode, they would understand that an operation of that diode has leakage current, correct? 11:36:44

A. A particular diode, when you get to the level of actual circuit design and choosing components, which is not in view in the '936 patent, then yes, you would -- every diode that you could buy would have some leakage current under different situations. 11:36:56 11:37:12

Q. Okay. So you've never seen a diode that doesn't have leakage current?

A. Semiconductor diodes will exhibit -- under certain circumstances will exhibit leakage current. 11:37:29

Q. All semiconductor diodes?

A. Yes.

Q. In the '936 patent, it doesn't say -- it doesn't have a statement to the effect of we're using diodes without leakage current? 11:37:40

A. Leakage current doesn't come into it at all.

Q. Okay. So there's no statement one way or the other about whether they are concerned with leakage current in the '936 patent. 11:37:53

A. There are all sorts of second-order effects that are left out of the '936 patent. Perhaps the most salient is the interwinding capacitance of the inductor. And none of those -- and that, for instance, has a bigger effect on the 11:38:07 circuit than the leakage current. So they're not -- the fact that they leave the leakage current out is consistent with their ignoring second-order effect, because they're not germane to the description. 11:38:19

Q. Okay. But a person of ordinary skill in the art would read the patent, in your opinion, and understand that there is interwinding capacitance associated with the conductor?

A. Well, they would understand that from 11:38:31 their background knowledge. They wouldn't find it in the patent.

Q. Right. Right. And the person of ordinary skill in the art, they read a patent with their background knowledge, right? They bring 11:38:40

description.

Q. But again, you agree that all physical diodes in the real world will exhibit leakage current?

A. Under certain operating conditions. 11:44:55

Q. Okay. So there are no physical diodes in the real world that will allow current flow in one direction only, period?

A. Well, you have to discuss it in the context of the circuit. Because, for instance, if 11:45:12 you -- if the diode is never reverse-biased --

Q. Then leakage current doesn't come into play.

A. Then you won't have any leakage current.

Q. So a diode doesn't always have to be -- its reverse-bias property doesn't always have to be used?

COURT REPORTER: Sorry. Could you just slow down?

MR. NEWTON: Sorry.

BY MR. NEWTON:

Q. I think what you just said or what you just suggested is that the reverse-bias property of the diode does not always have to be used.

A. That's right. 11:45:39

Q. There's applications where a diode might just be used to send current one direction --

A. Yes.

Q. -- and the reverse-bias feature doesn't come into play? 11:45:48

A. That's correct.

Q. Okay. So then let me try to phrase it in terms of what the diode is capable of doing. Any real-world physical diode will be capable of allowing leakage current in its reverse-bias 11:45:58 state, correct?

A. Yes. That's right.

Q. Okay. So there's no real-world diodes that will allow the flow of current in one direction only; they're all going to allow it in 11:46:12 both directions.

A. Well, I mean, it depends what you mean by allow. The --

Q. I'm just using Uber's definition.

A. Well, I understand that. But it -- the 11:46:21 thing is that when you say allow," -- and the reason why I don't like Dr. Wolfe's construction is that he says much more easily. And the -- just a moment. And the -- whereas I think that that is -- I think that is far more 11:46:38

misleading and less -- less likely to produce an accurate impression in the mind of somebody reading it or hearing it than Uber's construction, because it's not -- because "much more easily" might be -- in ordinary language might be a factor of 10, like the difference between picking up a cat or a child. 11:46:57

But the kind of differences we're talking about in the actual situation, for example, in the diode in the exhibit to my report, my declaration, the -- it's more like a factor of 10 to the 7. And that's the difference between picking up a child and picking up a skyscraper. 11:47:15

So it's not a -- you know, it's not -- it's really -- the level of abstraction as to how important this is, it's much more misleading to think of it in terms of just "generally much" as opposed to, you know, "gigantically more." 11:47:31

So in terms of an ordinary person's understanding, and certainly in light of the specification in the claim language, I think that Uber's construction is more accurate. 11:47:49

Q. But it doesn't accurately describe a real-world diode because a real-world diode will have leakage current. 11:48:04

A. A real-world diode will have leakage current, but at the level of abstraction of the discussion in the '936, that's not in view.

Q. Were any of the legal standards that counsel informed you of focused on looking at different levels of abstraction? 11:48:15

A. The part that I read in -- what was it? -- paragraph 20, I understand the construction that stays true to the claim language and most naturally aligns with the patent's description of the invention is the correct construction. 11:48:35

Q. And the patent just uses the term "diode," right?

A. Yeah. They say diode.

Q. And it doesn't have any specialized meaning of diode; is that right? 11:48:46

A. I'm not aware of the patent making -- providing a definition of diode, no.

Q. Going back to paragraph 55, you referenced what you said was Dr. Wolfe's construction. Now, you understand Dr. Wolfe didn't offer a construction, correct? 11:49:05

A. Well, he was asked about the different dictionary definitions and the one that he preferred. And he said he didn't like the one 11:49:17

that had anode and cathode in it because they were -- it was unnecessary and confusing to introduce those terms, and so he preferred this one.

Q. Right. But his position -- you read his declaration, right? 11:49:29

A. Yes. But he was -- he was agreeing with Waymo's definition.

Q. Well, Waymo didn't -- you read Waymo's --

A. Oh, sorry. Never mind. Yeah, that was his preferred definition. Waymo's is plain meaning. I see. 11:49:39

Q. Right. And Dr. Wolfe, in his declaration, he said that he thinks the term "diode" should get its plain meaning as well, right? He didn't offer a separate construction. 11:49:52

A. Well, he did say -- he did say that if a construction is made, this is what it should be.

Q. Right. But his primary position was that you don't need to construe the term "diode" -- 11:50:06

A. Yes, that's --

Q. -- because that's a well-understood meaning.

A. That's right.

Q. And you disagree with that? 11:50:08

scenario where you're actually building the circuit.

A. Okay.

Q. So my question was, you wouldn't be able to find a diode that you could use to build the '936 patent circuit that allows the flow of current in one direction only, correct? 11:54:57

A. It will exhibit leakage current.

Q. So the answer to my question is yes? I could ask it again if it got confusing. 11:55:11

A. Yeah. There are no diodes which would not, if you measured carefully, show leakage current if there were reverse-biased significantly.

Q. So there are no real-world diodes that would meet Uber's definition when used in a real circuit? 11:55:23

A. Again, we're not talking in this -- in this claim construction, we're not talking about features of diodes. We're construing claim terms. I mean, I'm not a lawyer, but I know the difference between those things. 11:55:40

Q. Right. And I'm just -- I'm asking about a real-world circuit. Right? So do you have that in mind? 11:55:52

PMEG10010ELR, that's in Exhibit 209?

A. Yes. It's a typical -- it's a typical diode which would be -- which would be suitable. I mean, in picking this one, I'm actually being a little bit generous because the -- it's a larger device that would have more leakage than one if it was more tightly specified. 12:10:29

Q. If you were to build an embodiment of the '936 patent circuit, there's a variety of different types of diodes you could use. 12:10:57

A. Yes.

Q. And that would be normal for a person of skill in the art to look at different types of diodes, consider different types of diodes?

A. Yes. 12:11:09

Q. And they'll have different operating values; is that right?

A. Operating values? I don't know what you mean.

Q. Different forward voltage and reverse voltage? 12:11:18

A. Well, they'd have different specifications, sure.

Q. Different prices?

A. Yes. 12:11:26

Q. And they would have different amounts of leakage current?

A. That's right.

Q. And what -- so now just talking about a diode generally, what dictates the amount of leakage current that it's going to exhibit? 12:11:41

A. Generally speaking, it's the size of the diode. You can look at a large diode as being a whole bunch of small diodes in parallel so that the leakage currents would add. The temperature, the -- and the technology. 12:11:55

So for instance, other things being equal, a diode rated for higher reverse voltage will have less leakage at a given -- at a fixed reverse voltage. 12:12:18

Q. Is there typically an association between cost and the amount of leakage current?

A. Only incidentally. Leakage current is nearly always negligible, so most of the time you don't care very much. 12:12:44

The -- this diode costs about a dime in quantity. So if you're building a circuit, you know, if you can get a better diode for the same price, you might as well use the good one.

Q. Diodes also have a property called 12:12:59

breakdown; is that right?

A. That's right.

Q. And I don't think you discussed it in your report, but tell me if I missed it.

A. I don't recall discussing breakdown, no. 12:13:13

Q. Okay.

MR. NEWTON: Could we go off the record a minute?

MR. MUINO: Sure.

VIDEO TECHNICIAN: The time is 12:11 p.m. 12:13:24
We're going off the record.

(A recess was taken.)

VIDEO TECHNICIAN: The time is 1:08 p.m. This begins media unit number 3. We're now on the record. 13:10:01

Please proceed, Counsel.

BY MR. NEWTON:

Q. Dr. Hobbs, will you go to paragraph 63 of your report?

A. Okay. 13:10:12

Q. And here you have a figure that was included in Dr. Wolfe's report?

A. That's right.

Q. So -- and this is a graph showing the current as a function of voltage for a diode; is 13:10:37

Q. So here in paragraph 22 you offer an opinion that the '936 patent discloses a step-up circuit. Do you see that?

A. I do.

Q. Do you agree that the term "step-up circuit" is not used in the '936 patent? 13:15:10

A. I don't recall it being used there.

Q. Do you recall seeing the words "step-up circuit" in the claims of the '936 patent?

A. No. 13:15:29

Q. Is it your opinion that this concept of a step-up circuit is the only invention claimed in the '936 patent?

A. It's what's in the -- it's what's claimed in the claims that have been asserted. 13:15:53

Q. Is that the only invention in the asserted claims?

A. I think so.

Q. So you don't think there's any other invented aspects of the '936 patent besides the concept of the step-up circuit? 13:16:07

A. Well, I mean, this -- there are -- there's the whole charging and discharging arrangement.

Q. You agree with me generally that a patent 13:16:26

the phase of the -- at pi phase for the sine wave. So it starts out at minus 1 times the supply voltage. And then it increases as -- and as it's going through the -- as it goes through the supply voltage, it begins to curve the opposite direction. So you wind up with, in the ideal case, exactly half a sine wave.

Q. Okay.

A. Half a cycle of the sine wave.

Q. So the shape of the graph for the capacitor charging would be half a sine wave? 13:23:42

A. Well, half a cycle of a sine wave.

Q. Half a cycle of the sine wave.

A. Uh-huh. Starting from the negative peak and winding up at the positive peak. 13:23:58

Q. So the voltage doesn't just jump from zero to its maximum --

A. No, that's right.

Q. -- instantaneously, correct? Okay.

During that charge cycle, you could open the switch at any given time, right? 13:24:09

A. Yes, you can, at some danger of destroying the switch.

Q. Okay. And at any given time that you open the switch during the charge cycle, whatever 13:24:25

charge is on the -- or -- I'm sorry. Let me strike that.

During the charge cycle, the switch is open; is that right?

A. Yes. 13:24:37

Q. Okay. And during this time while the switch is open, the voltage on the capacitor is increasing in this sinusoidal fashion that we discussed?

A. Yes. Until the diode catches it. Then it stops. 13:24:49

Q. Right. Right.

So between the point where it starts charging and it stops charging, at any given time in that interval you could close the switch, correct? 13:25:02

A. Yes.

Q. And if you close the switch, whatever voltage is on the capacitor at that point will discharge through the load? 13:25:11

A. That's right.

Q. Okay.

A. If it's -- again, in the ideal case. Diode lasers need a certain amount of voltage on them for that to work. But in the -- with an 13:25:19

ideal linear load, yes, that's true.

Q. So if you wanted to design the circuit in paragraph 35, you could do it such that you discharge the capacitor through the load at the point at which the voltage on the capacitor is equal to the maximum voltage of the voltage source? 13:25:38

A. Yes. Or you could just leave the switch on all the time.

Q. You mean closed? 13:25:52

A. Yes.

Q. Not that I was correcting you, just clarifying.

A. That's fine. Clarity is a good thing.

Q. And we talked about the inductor and the diode, correct? 13:26:04

A. Yes.

Q. In your opinion, would there be any change in the operation of the circuit if those two elements were switched so that the diode was between the voltage source and the inductor? 13:26:26

A. Well, at this level of abstraction, no, because they weren't in series and we're not taking account of any of the other places the current could go -- into straight capacitance, for 13:26:42

instance. But for all intents and purposes, in the circuit under discussion, it would make no difference.

Q. When would it make a difference?

A. Well, it would -- it might make a difference if the inductor were -- if the capacitances were very low and the inductor were physically large. 13:26:50

Q. Why is that?

A. Well, because the -- an object has a capacitance of its own which is approximately equal to, if you take its diameter in centimeters, that's how many picofarads you get for its self-capacitance. And so you could -- whereas you could get diodes which have very, very, very low capacitance. So it might make a small difference in a very high-impedance circuit where you care very much about a picofarad or two, but not in a high-power circuit such as we're discussing. 13:27:04 13:27:21

Q. So if I take this circuit in paragraph 35 and I have the diode and the inductor flipped, and let's say I charged the capacitor all the way up to its maximum value -- 13:27:41

A. Uh-huh.

Q. -- will any of that current that's -- and 13:27:54

A. Yes.
Q. And this is one of the terms that Uber has offered a construction for; is that correct?
A. Yes, it is.
Q. And it's your opinion that the term "charging path" -- a person of skill in the art would conclude that the recited "charging step" is a step-up circuit; is that correct? 13:51:36
A. Yes, because it doesn't have a plain and ordinary meaning, and the -- and so he would naturally look to the spec, and that's what he'd find there. 13:52:06
Q. So outside of the '936 patent, if someone came up to you in your work and said -- and used the term "charging path" with respect to a circuit, you wouldn't know what that meant? 13:52:19
A. Well, I mean, something was being charged, but I wouldn't know if it was a capacitor or a battery or a credit card.
Q. But you would understand that something is being charged along a path? 13:52:30
A. Well, that's not a definition, though. That's just reordering the words.
Q. Right, but you just said you would understand something was being charged, right? 13:52:41

A. But "charged" has many senses, and it's not -- so I wouldn't say that that would convey anything. I would say -- if somebody said, my circuit has a charging path, I'd say, that's nice. You know, I gather that's probably for the battery, at which point he'd have to correct me and say, no, it's for a capacitor. Oh, okay. What's it do? 13:52:52

Q. Well, what if somebody said, I have a battery and a capacitor and a charging path between them? Would you still not know what that meant? 13:53:04

A. Well, I would -- I would guess that he would be using the battery to charge the capacitor somehow. But it would convey nothing as to how that was being done. 13:53:15

Q. What would it convey?

A. Well, just that -- if he said that there's a battery and a capacitor and a charging path, then I would guess that the path was whatever means he was using to charge the capacitor. But, you know, I could think of several of those right off the bat. 13:53:31

Q. Does path have an ordinary meaning?

A. It has at least one ordinary meaning. 13:53:46

Yeah.

Q. Does it have an ordinary meaning in circuit design?

A. Well, I was talking about circuit design.

Q. So what would you, if you were just asked -- outside the context of this case and the patent, if you were asked in general within circuit design what does path mean, what would your answer be? 13:54:03

A. I mean, it would include a way for current to pass through some collection of components. But it could also -- but it could also mean, in the operation of a circuit, the way the circuit passes through a sequence of states. 13:54:19

Q. What about the term "charging"? Does that have an ordinary meaning in circuit design? 13:54:49

A. Well, it has several.

Q. Same -- I'm sorry. Go ahead.

A. No, go ahead.

Q. Same questions I asked with respect to path. If somebody just came up to you and asked you, what's the ordinary meaning of charging in the context of circuit design, what would you say? 13:55:01

A. Well, I would say putting charge on something. But the -- but there are lots of 13:55:16

others.

Q. Okay. So Uber's construction of charging path is a path allowing current to flow from the inductor to the capacitor; the path configured to charge the capacitor to a voltage higher than the supply voltage. Is that right? 13:55:33

A. Yes.

Q. And why don't we look at this with respect to claim 1 of the '936 patent. I believe you have it as Exhibit 204, if I'm not mistaken. 13:55:53

A. Okay. Here we go. Claim 1?

Q. Yeah.

A. Okay.

Q. So claim 1 recites charging path in the clause that starts with, "a capacitor coupled to a charging path and a discharge path." 13:56:32

A. Yes.

Q. And the claim says that the charging path includes the inductor and the diode; is that correct? 13:56:46

A. Yes.

Q. And then the "wherein" clause, the first one says, "responsive to the transistor being turned off, the capacitor is configured to charge via the charging path such that a voltage across 13:56:57

the capacitor increases from a lower voltage level to a higher voltage level."

Do you see that?

A. Yes, I do.

Q. Okay. So do you agree with me that claim 1, at least the plain language, does not say anything about the charging path being configured to charge the capacitor to a voltage higher than the supply voltage? 13:57:06

A. Well, it includes a limitation of a diode, which you wouldn't need if you weren't doing that. So that's the -- it doesn't say it explicitly, but there would be no point in having the diode there if you didn't. 13:57:21

Q. Okay. My question was, does it say it explicitly? I think your answer was no. 13:57:33

A. No, but one can infer that from the presence of the diode.

Q. Does the presence of a diode automatically cause the circuit to increase to a voltage -- let me strike that. 13:57:48

Does the presence of the diode cause the charge on the capacitor to automatically increase to a voltage higher than the supply voltage --

A. No. 13:58:03

Q. -- during the charge cycle?
A. No.
Q. And if you go down to claim 4 -- do you see that?
A. Yes. 13:58:26
Q. And I don't think you addressed claim 4 in your declaration, right?
A. I don't believe so, no.
Q. Okay. You agree with me that where a dependent claim adds a particular limitation, you 13:58:44
can presume that the independent claim does not include that limitation?
A. I would need to ask counsel to clarify that for me.
Q. I think that's in -- why don't you go to 13:58:53
paragraph 15 of your report. The last sentence, can you read that one?
A. Oh, yes. Thank you.
Q. Could you read it into the record?
A. "For example, when a dependent claim adds 13:59:24
a particular limitation, one can presume that the independent claim does not include that limitation."
Q. Okay. And that's your understanding?
A. Well, that -- that's what I'm given to 13:59:32

V1. I think it says that down at about line 65 of column 18.

Q. Let's look at line 58. It says, "The capacitor 516 charges until the voltage on the capacitor 516 is approximately equal to the voltage at node A." 14:16:29

A. Yes.

Q. Okay. So at that point in time, will the capacitor be fully charged?

A. They appear to be talking about the forward voltage drop of the -- of the diode going to zero so that there's -- so that the voltage on the capacitor is at node A. And that's where -- that's where the diode enters reverse bias. So that would be fully charged. Yes. 14:16:39 14:17:09

Q. Okay. So when the capacitor is fully charged, at least initially, it will have the same voltage as the voltage at node A?

A. That's right.

Q. And you said already the voltage at node A may be above the voltage of the voltage source, but it doesn't have to be? 14:17:28

A. Well, it has to be a little above because of the diode drop. But if you -- but if you -- again, if you make the circuit sufficiently badly 14:17:46

so that the -- so that the diode doesn't do anything, then you could certainly put -- choose components where that wouldn't be the case.

Q. Then at line 62 it says, "Upon the diode being reverse biased, the current through the diode [sic] 510 goes to zero, the voltage across the inductor 510 settles at zero, which sets node A to the voltage of the voltage source 502 (e.g. the voltage V1), but the capacitor may hold a higher voltage (e.g. about 2 V1)." 14:18:16 14:18:37

A. Yes.

Q. And again, that's using permissive language; it says it may hold a higher voltage than the voltage source.

A. Yes, it does. 14:18:49

Q. And if you go to column 19, line 26 through 27.

A. Okay.

Q. Again, it says, "The charge on the capacitor 516 may exceed the voltage V1 of the voltage source 502." 14:19:09

Do you see that?

A. I do.

Q. So again, it's saying that the charge on the capacitor may exceed the maximum voltage of 14:19:21

the voltage source, but it doesn't have to?

A. Yes. I imagine they mean the voltage on the capacitor.

Q. Instead of the charge on the capacitor?

A. Yes. 14:19:32

Q. Then line 31 of column 19 says, "For example, the capacitor 516 may be initially charged to a voltage level of about 2 V1."

So again, there, it's using permissive language to say that it may be charged above the 14:19:59 voltage of the voltage source.

A. That's right. I mean, permissive language is another one of those lawyerisms that I wouldn't want to set my name to the full legal dictionary definition. But from a technical guy's 14:20:16 point of view, that's true.

Q. Jumping to column 21 --

A. Yep.

Q. It says, "In some examples, the voltage" -- I'm sorry, column 21, line 3. It 14:20:35 says, "In some examples, the voltage at which the two voltages are approximately equal so as to terminate the charging cycle occurs for a voltage of about 2 V1."

A. Yes. 14:20:50

Q. So there it's saying in examples of the invention, the voltage on the capacitor can be 2 V1?

A. Yes. We've discussed cases where it could be more or less, depending on what you do with the switch. 14:21:00

Q. So you agree those are just examples; it's not a requirement to charge it up to 2 V1?

A. Not the exact value, no.

Q. I had a question I wanted to go back to about something we were discussing earlier in the context of your LiDAR project. And I think there was a distinction you were making between pulsed operation and continuous operation. 14:21:12

A. Yes. 14:22:21

Q. Is -- was that in the context of the coherent LiDAR that you were looking at?

A. That's right. You can do coherent pulsed LiDAR, but CW is more common.

Q. Okay. CW is continuous -- 14:22:37

A. Continuous wave, yeah.

Q. -- wave?

A. In other words, you leave the laser turned on all the time.

Q. Okay. What is the laser in that example? 14:22:40

A. Well, I was looking at using a 1.54-micron diode laser. But I was -- but since there's a variety of ways of doing that, I was concentrating on the general physical requirements on the detection side. 14:22:59

Not being a laser designer, I don't -- lasers are something that I buy.

MR. NEWTON: Why don't we take a break.

VIDEO TECHNICIAN: The time is 2:21 p.m. This completes media unit number 3. We're now off the record. 14:23:37

(A recess was taken.)

VIDEO TECHNICIAN: The time is 2:42 p.m. This begins media unit number 4. We're now on the record. 14:44:25

Please proceed, Counsel.

BY MR. NEWTON:

Q. Dr. Hobbs, could you go to paragraph 66 of your report?

A. Okay. 14:44:33

Q. This is charging path limitation, right?

A. Yes.

Q. And then -- actually, I want to jump to 76. This is still in the charging path section.

A. Okay. 14:45:02

Q. If the time it takes you to finish charging the capacitor exceeds the time when you need it to fire the laser diode, it's not going to meet the immediate requirement.

A. Well, sure. It's not going to meet the operational requirement either. 15:02:39

Q. Okay.

A. One can -- you know, one can put bounds on what the required repetition rate is, at least approximately. 15:02:55

Q. What do you mean by repetition rate?

A. Well, the rate -- the rate at which each individual laser fires.

Q. Do you mean pulses per time?

A. Yes. 15:03:17

Q. And every circuit -- every laser diode firing circuit is going to have a specified or a preferred repetition rate; is that fair?

A. Well, it will have a maximum repetition rate because, otherwise, there won't be time to charge the capacitor. Or there could be other reasons, for example, that the maximum power dissipation in the active devices is exceeded. Diode lasers don't work well when they get overheated, for instance. 15:03:37 15:03:51

Q. So what impacts the charge time?

A. Well, mostly the -- it's mostly the inductance and the capacitance. It's essentially independent of the supply voltage above some level where the diode drops become important. 15:04:18

Q. When you say capacitance, do you mean capacitance on the capacitor that's actually being charged?

A. Yes, that's right. It's the circuit constants of the resonant circuit. Because we -- 15:04:38 we know that in the circuit of figure 5A it takes half a cycle of whatever the free resonance of the LC circuit is, and that's -- and that frequency is 1 over 2 pi times the square root of LC. So you can work it out easily what the... 15:04:56

Q. What was the equation?

A. It's the -- the resonant frequency in hertz is 1 over 2 pi times the square root of LC. All that's on the denominator.

Q. And what is that going to tell you? 15:05:11

A. That if you -- that if that is -- in the circuit under discussion, that will come out to be right around 1 megahertz. And so you know that it takes half a cycle, which is -- one cycle is 1 microsecond, and so half a cycle is 500 15:05:33

nanoseconds.

Q. So is that where you think they got the 500 --

A. Yes, it is.

Q. -- nanoseconds for the circuit? 15:05:42

A. It's clearly described as being half a cycle of the free resonance.

Q. Could you do that calculation for any given circuit?

A. Yes. At -- again, at a particular level of abstraction, because you've got to worry about -- the diode has some non-linear capacitance, which doesn't matter here, but might in some other cases. So does the switch. Probably the diode laser does, too. 15:05:57 15:06:10

Q. And you agree that in the circuit of the '936 patent, in the, say, figure 5 --

A. Uh-huh.

Q. -- any charge time less than or equal to 500 nanoseconds, you agree that will meet the immediate requirement? 15:07:03

A. Well, in the -- given that the pulse repetition rate of this -- the LiDAR that it's intended to operate in is on the order of 16 kilohertz, that's -- 500 nanoseconds would be 15:07:21

fine.

Q. And for a given LiDAR, you would know the pulse repetition rate?

A. Yes. That would be one of the very important design constraints at the highest level. 15:07:36

Q. Okay.

A. Because it's basically the product of the number of points in each point cloud and the number of point clouds you need per second in order to get good control of the vehicle. 15:07:55

Q. Talking again about the '936 patent, though, you don't need to know that pulse repetition rate to understand that 500 nanoseconds or less meets the immediate requirement, right?

A. Well, it might not. 15:08:12

Q. Doesn't the patent tell you it does?

A. Well, it does for that -- for that -- for this embodiment. I thought you meant in general for any charging circuit.

Q. No. I'm just saying -- I'm just asking you whether you agree that the patent says, in our circuit of figure 5, 500 nanoseconds is an example of immediately. 15:08:21

A. Yes. I think that -- it's certainly -- it's ready much sooner than it needs to be, so you 15:08:36

don't have to care how long it takes. That's -- that would make it immediate in my lexicon.

MR. NEWTON: No further questions.

MR. MUINO: All right. I'd like to designate the transcript highly confidential, attorneys' eyes only, under the protective order. 15:08:55

I have no questions for the witness.

MR. MARABELLA: I have no questions for the witness, either.

VIDEO TECHNICIAN: The time is 3:07 p.m. This concludes today's testimony given by Dr. Philip Hobbs. The total number of media units used was four and will be retained by Veritext Legal Solutions. 15:09:06

We are now off the record. 15:09:24

(Whereupon, at 3:07 p.m., the highly confidential attorneys' eyes only Videotaped deposition of PHILIP HOBBS was concluded.)

CERTIFICATE OF NOTARY PUBLIC

I, CHRISTINA S. HOTSKO, the officer before whom the foregoing deposition was taken, do hereby certify that the witness whose testimony appears in the foregoing deposition was duly sworn by me; that the testimony of said witness was taken by me in stenotypy and thereafter reduced to typewriting under my direction; that said statement is a true record of the proceedings; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this statement was taken; and, further, that I am not a relative or employee of any counsel or attorney employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

CHRISTINA S. HOTSKO
Notary Public in and for the
District of Columbia

My commission expires:
November 14, 2021